

A ROSETTE DISEASE OF POTATOES.  
ATTRIBUTED TO THE STERILE FUNGUS RHIZOCTONIA

DISSEMINATED ON SEED TUBERS  
METHODS OF PREVENTION. LITERATURE LIST.

OHIO  
Agricultural Experiment  
Station

WOOSTER, OHIO, U. S. A., APRIL, 1903

BULLETIN 139



EXPERIMENT STATION PRESS

*The Bulletins of this Station are sent free to all residents of the State who request them. Persons who desire their address changed should give both old and new address. All correspondence should be addressed to*  
**EXPERIMENT STATION, WOOSTER, OHIO.**

ORGANIZATION OF THE  
OHIO AGRICULTURAL EXPERIMENT STATION.

---

BOARD OF CONTROL.

ALVA AGEE, President.....	Cheshire
O. E. BRADPUE, Secretary .....	Xenia
D. L. SAMPSON, Treasurer....	Cincinnati
HON. FRILND WHITTLESIV.....	Atwater
D. D. WHITE .....	Castalia

---

STATION STAFF.

CHARLES E. THORNE, M. A. S.....	Director
WILLIAM J. GREEN .....	Horticulturist and Vice Director (Superintendent of Orchards, Gardens and Greenhouses.)
AUGUSTINE D. SELBY, B. SC. ....	Botanist (In charge of botanical and plant physiological and pathological investigations.)
C. G. WILLIAMS.....	Agriculturist (Superintendent of Farm.)
JOHN W. AMES, B. SC. ....	Chemist
P. J. PARROTT, A. M.....	Entomologist
WILLIAM H. KRAMER.....	Bursar
JOHN F. HICKS.....	Assistant Botanist
CLARENCE W. WARD, B. SC. ....	Assistant Horticulturist
J. S. HOUSER.....	Assistant Entomologist
WILLIAM HOLMES.....	Farm Foreman
CHARLES A. PATTON.....	Meteorological Observer
CARY WELTY.....	Mechanic
JAMES L. TAGGART.....	Horticultural Foreman
FAYE BLAYNFY.....	Mailing Clerk
MARY M. LEE.....	Stenographer
FRANK W. GLASS.....	Printer

---

EDWARD MOHN.....	Supt. Northeastern Test-farm, Strongsville
HENRY M. WACHTER.....	Supt. Southwestern Test-farm, Germantown
LEWIS SCHULTZ .....	Supt. Southeastern Test-farm, Carpenter

---

The Bulletins of this Station are issued at irregular intervals. They are paged consecutively, and an index is included with the Annual Report, which constitutes the final number of each yearly volume.

BULLETIN

OF

Ohio Agricultural Experiment Station

---

NUMBER 139.

APRIL, 1903.

---

A ROSETTE DISEASE OF POTATOES,

ATTRIBUTED TO THE STERILE FUNGUS RHIZOCTONIA.

BY A. D. SELBY.

Dating back at least three years we have had in Ohio complaints of the early dying of the potato vines before the formation of many tubers; the underground parts appear to be the seat of the disease agency, while at the same time excessive branching in some examples and in general a conspicuous clustering of these branches, or of the terminal leaf groups, together with early dying of the entire tops, have been the conspicuous above-ground characters. In 1900 one grower, who had purchased seed of the Enormous variety from the Station, suffered a very large loss from this disease. Attention was at this time called to the malady but no satisfactory explanation was secured.

In the same season there was a small amount of dying of the vines of the entire hill in the Station fields, grown from the same lot of seed, but no specific cause for this dying was ascertained. In the fall of 1900 the sclerotia of the sterile fungus *Rhizoctonia* were discovered in abundance on tubers of the Triumph variety, and likewise upon some other varieties at the Station. This led to some treatment experiments under the writer's direction, conducted by the Assistant Botanist, Mr. John F. Hicks, in the pathological garden, during the season of 1901.

About June 1, 1902, Mr. Alva Agee, of Cheshire, Gallia county, called attention to a serious condition of his potatoes of the Carman variety and solicited a study of the trouble, which was accordingly

made by the writer on June 7th. It was found that from 10 to 12 per cent of the hills of this variety, grown from seed obtained from the Experiment Station, were affected by a disease of the character briefly described above. There was, in many instances, stunted growth, with rosettes or rosette-like clusters of the upper leaves; in others, marked clustering of the leaves without apparent retardation of growth. Above ground the stems showed occasional discolored areas of soft decay, while below the soil surface were numerous lesions in the form of brown, dead areas; thanks to the kindness of my wife, a few drawings were made illustrating the condition of these underground stems from Mr. Agce's field, (Figs. 1 and 2.) Occasional offshoots bearing small tubers had been partially destroyed by similar lesions to those figured on the stems. These conform very closely to the description and illustration given by Rolfs<sup>1</sup>, his publication having been received during the course of this study.

Upon reaching the laboratory, microscopic study of the fresh material revealed the apparently constant presence of the hyphæ of the fungus *Rhizoctonia*. Throughout the remainder of the season somewhat careful study was made of this rosette disease in the Station potato fields at Wooster, where the disease was prevalent upon a number of varieties grown in the potato plots. Through the coöperation of the horticultural department further seed treatment experiments were carried out by Mr. J. L. Taggart, Garden Foreman. Specimens of potatoes similarly diseased were sent to the Station from other points in the State.

The studies of the fungus have been continued by cultures during the intervening time. It has seemed of possible value to publish the results of the preliminary study in order to call attention to the disease, to secure more extended coöperation in the further investigation and to encourage treatment of seed potatoes with formalin. While the disease as herein outlined may not be as sweeping in its ravages as some better known troubles of the potato, it promises to reward further study and efforts in its control.

#### SPECIAL CHARACTERISTICS OF THE ROSETTE DISEASE.

The diagnostic features in this malady are twofold in character. They arise from the changes in the stem by reason of the lesions below ground or near the surface above ground, and from the peculiar branching or clustering of the leaves. The leaf clustering, though possibly secondary, is so conspicuous that a mere walking

<sup>1</sup> Bulletin No. 70, Colorado Agricultural Experiment Station, p 7, Plate VII.

or driving through the field affords sufficient opportunity to detect a large percentage of the affected plants. These abnormalities of the leaves are useful only from the fact that they are striking evidences of something wrong—they enable the potato grower to walk through his field and locate the trouble. (Figs. 4 and 5.) However, they offer no clue as to the cause which brings about such clustering; it would seem even possible that a variety of causes might result in checking the growth of the shoot and giving this rosette aspect.

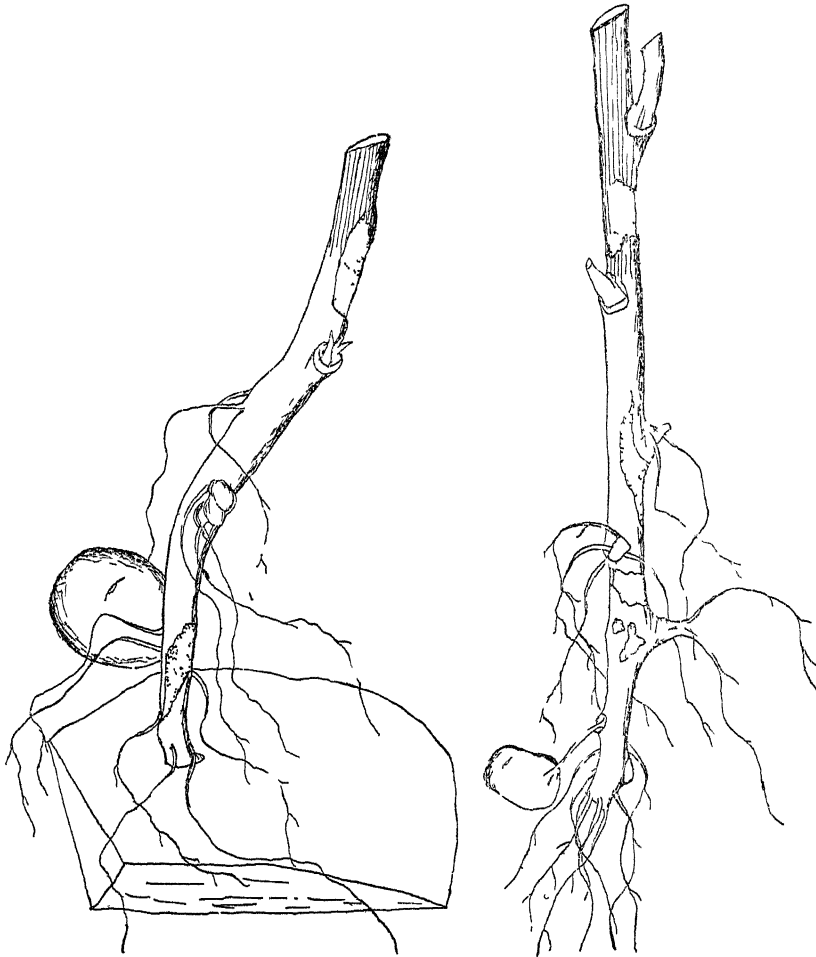


FIGURE 1.

FIGURE 2

FIGURES 1 and 2 Illustrative examples of injuries on Carman No. 3, Cheshire, June 7, 1902. The shaded areas were dark with an abundance of *Rhizoctonia* hyphae; the tops showed conspicuous "rosette" effects. (From drawings by Mrs. Selby.)

It may be observed in passing that while the leaves on such branches do not resist the leaf blight fungi as much as do normal leaves, yet the leaves cannot be pointed out as the foundation of the trouble. It is otherwise when we consider the local areas of the stem in which there is softening or death of the external portion; this we find in the lesions before mentioned. They are of diverse

appearance, commonly having a darker character than the whitened portion of the stem beneath the earth. The illustrations, Figures 1, 2 and 3, will show that these diseased areas, which are commonly brownish or dark, may be irregular in shape or of almost an elliptical form. Often in advanced stages of the trouble an oblong "blaze" more than an inch in length may be found along the side of the potato stem. (Fig. 3.) When we seek for the cause and endeavor to give the etiology of this disease, investigation must be chiefly concerned with the production of these lesions on the stem. It is to be expected that the shoots of the plant will show the effects of so serious a disease on the stem near its base.



FIG. 3. Slender, dwarfed and diseased plant, Wooster, the only one growing in hill and showing slender stem, sparse foliage with "blaze" injury at base from the fungus. (Redrawn from photograph by A. Mariolle.)

The writer has deemed it better for the present to describe this disease under the name of "A rosette disease of potatoes." While this characteristic appearance of the leaves of the diseased plants adequately describes the gross characters, at the same time it is possible that other parasites than rhizoc-

tonia may cause lesions not otherwise distinguishable from those occurring on the potato stems we have investigated.

THE DISEASE APPARENTLY DISSEMINATED ON SEED TUBERS—  
PREVENTED BY SEED TREATMENT.

The fact that in 1900 the Enormous variety, grown from the same lot of seed, showed much greater damage in Gallia county than at Wooster, more or less disguised the true source of the trouble in Gallia county, namely, the seed tubers which were obtained at Wooster. In 1902, however, with the Carman variety no such disguise was possible. Potatoes of other varieties and potatoes of the same variety grown from the seed tubers derived from another source showed at Cheshire none of the rosette disease; it was solely in the plants grown from the seed tubers obtained from Wooster that the disease occurred. A like disease was found prevailing in the plots at Wooster grown from the same seed in 1902. The further fact that the sclerotia of the fungus to which the disease is attributed have been found in abundance upon tubers where the disease prevails would support the charge against the seed tubers. Clearly one satisfactory method of proving such cases is that of planting treated and untreated seed tubers; in this case the treatment must be such as to destroy the possible beginnings of the fungus which occur on the tubers. For two seasons treated and untreated seed tubers have been planted with results which appear below:

In 1901 the tubers obtained from the treated portion still showed many evidences of rhizoctonia. In 1902 there was practically no evidence of the rosette disease in the leaves of the growing plants in the rows treated with formalin; a like effectiveness did not appear to hold where the seed potatoes were treated with corrosive sublimate. In the potato fertilizer plots all but six were planted with seed treated with corrosive sublimate and received the several allotments of the different fertilizers employed in the regular potato experiments. In all cases there was no apparent difference in the percentage of plants affected with the rosette in the treated as compared with the untreated plots in this group. The formalin treatment was employed only in a small way on other plots.

TABLE I.—SEED TREATMENT FOR RHIZOCTONIA IN 1901.  
*Yields of equal lengths of single rows.*

TREATMENT	AVERAGE YIELD PER ROW.					
	ROW	Mixed Variety	ROW	Blue Victor	ROW	Triumph
Nothing . . . . .	1	5 lbs. 5 oz.	5	4 lbs. 5 oz.	8	16 lbs. 8 oz.
Formalin . . . . .	2	8 lbs. 6 oz.	6	11 lbs. 14 oz.	9	17 lbs.
Nothing . . . . .	3	6 lbs. 12 oz.				
Corrosive sublimate. ....	4	2 lbs. 5 oz.	7	2 lbs. 13 oz.	10	11 lbs. 5 oz.

TABLE II.—SEED TREATMENT FOR RHIZOCTONIA IN 1902.

*Yields\* of rows of equal length.*

TREATMENT	ROWS AND VARIETIES.						
	row	Enormous	row	Green Bay T	row	Rural N. Y.	row
Formalin .....	1	66 pounds	5	73 pounds	9	83 pounds	11
Nothing .....	2	34 pounds	6	40 pounds	10	93 pounds	12
Corrosive sublimate..	3	23 pounds	7	99 pounds			
Nothing .....	4	41 pounds	8	89 pounds			

\* Owing to the fact that the rows of potatoes were in ground previously in blackberries and extended in the same direction as the blackberry rows, difference in yield, due to this cause, must be considered.

In 1901 tubers which showed sclerotia of the rhizoctonia were selected, the choice often falling upon those more or less cracked open. The results show an advantage in the rows treated with formalin over those untreated and places seed treated with corrosive sublimate at a disadvantage over untreated, a result which may be attributed to injury of the seed, since this disadvantage is not borne out in other work where corrosive sublimate was employed. It will be noted that the difference between formalin treated and untreated rows of Triumph variety is very slight. The results of 1901 may properly be taken, I believe, as indicating the relative efficiency of formalin seed treatment without indicating the amount of advantage derived from the treatment.

In 1902 the experiments were inaugurated after the Cheshire case had been made known, and were placed where space was available. The seed was not assorted with reference to the particular tubers, being taken from the remnants of the varieties used. Those rows of potatoes coincident with the rows of blackberries just previously removed, show higher yields regardless of treatment. Rows 1, 2 and 3 are comparable but some of the others are uncertain. It is not to be expected that yields under treatment with corrosive sublimate will fall below the nothing plots.

The warranted conclusion, drawn from tests of two seasons with formalin and the extended work of many seasons at the Station with corrosive sublimate appears to be that corrosive sublimate seed treatment does not prevent the rhizoctonia disease to any appreciable extent, while the formalin seed treatment, as shown conspicuously by study of the growing plants and usually in the yields of tubers, does prevent the disease to a very marked extent.



## OTHER CHARACTERS OF SIGNIFICANCE.—LOSSES CAUSED.

Among other significant characters in the rosette disease may be stated the extreme diversity in injury among several varieties grown at the Station. The Enormous and the Carman already mentioned have been conspicuously attacked by this disease; likewise several seedlings supplied by a potato grower of Holmes county. During the present season the rows of the Enormous and of the seedlings just named were very ragged and showed a very poor stand. With these two sorts a considerable portion of the diseased plants was destroyed before very much branching of the stems. Upon Carman and a number of other varieties, the disease was prevalent but usually not so destructive early in the season; the attacked plants with the Carman more often branched and formed a few tubers. The data thus far obtained are apparently in harmony with the idea of infected seed. Since the potatoes at the Station are grown in a 3-crop rotation it is likely also that the potato soil becomes more or less infected with soil fungi. It is significant that the losses here at Wooster have not been very large; indeed it seems that they are rather less than the losses suffered at Cheshire, particularly on the Enormous in 1900. While the soils in question in both areas are acid, a difference in acidity might influence the result. It has been shown that acidity of the soil is unfavorable to potato scab.<sup>2</sup> It would appear from the work of Duggar<sup>3</sup> and Stewart<sup>4</sup>, that a slight alkalinity is unfavorable to rhizoctonia; therefore while liming might be unfavorable to rhizoctonia attack and accordingly in a sense a prevention of the rosette disease where induced by attacks of this fungus, the liming would tend to increase the scab injury.

One matter of significance is the relatively small losses commonly traced to this disease. All potato growers are accustomed to see occasional hills in a potato patch dying off, and so common is this that it appears to excite little wonder. In this disease we appear to have at least one of the causes of this loss.

The hills of badly diseased plants are often of two distinct types; in the one the stems are short yet thick, and have the leaves in dense rosette form. (Fig. 4.) In the other type noted the plants are slender, the stems of small diameter and the growth such as might occur in poor soil. (Fig. 3.) Both types of plants commonly perish before the maturity of healthy plants and the tubers are very small in case any are produced.

<sup>2</sup> Bulletin 33, Rhode Island Agric. Exp. Sta. (1895)

<sup>3</sup> Bulletin 186, New York Agric. Exp. Sta.

<sup>4</sup> Bulletin 186, Exp. Sta. of Cornell University.

From the standpoint of losses, the rosette disease of the potato is similar to the potato scab; usually neither entirely destroys the crop but both may diminish the yield and in that way the market value. The scab also reduces the market value by roughening the tubers; an external cracking of the tubers may be referable to the attacks of rhizoctonia. Probably from 6 to 20 percent of diseased hills will cover the usual amount of rosette disease where prevalent; nevertheless, such a proportion of these plants should well repay prevention, especially so since it now appears to be possible to reduce this disease largely by using formalin treatment instead of the corrosive sublimate method for the seed potatoes.

#### CAUSE OF THIS ROSETTE DISEASE.

The cause, or as the physicians are wont to state it, the etiology of this disease is not as conclusively demonstrated as one would like. The sterile fungus rhizoctonia is indicated as the cause in the instances stated, by its constant presence, and a high degree of probability attaches to this indication. It is found on the seed tubers which produce diseased plants: such tubers when stored in a warm place have been grown to the production of elongated, etiolated, leafless stems, destroyed at their summits by the rhizoctonia as evidenced by microscopic study of the diseased parts. The fungus grows vigorously in cultures and while producing no clearly recognized spore-forms it produces dense masses of the fungus threads, or hyphæ, which are very abundant on the tubers and occur in great profusion upon the potato tubers found upon the market. These masses, which are dark brown to almost black in color, are capable of surviving under adverse conditions and of growing and reproducing the fungus in a purely vegetative manner.

Allied species of rhizoctonia have been accredited in America, one as the cause of root rot of cotton<sup>5</sup> and another as a root rot of sugar beets.<sup>6, 7</sup>

A fuller history is given by Duggar and Stewart in the bulletins cited on page 59. Without entering into a full, technical discussion at this time, it may be stated that the potato rhizoctonia, *Rhizoctonia Solani* Kuehn, has long been accredited with injuries on potato tubers. Kuehn<sup>8</sup>, an early German plant pathologist, viewed it as the cause of scab (*Schorf*) and this view has been reiterated with respect to France by Roze<sup>9</sup> (II), several years after the researches of Thaxter and

<sup>5</sup> Atkinson, G. F., Bulletin 41, Ala. Agr'l. Exp. Sta., 1892.

<sup>6</sup> Pammel, L. H., Bulletin No. 15, Iowa Agr'l. Exp. Sta., 1891.

<sup>7</sup> Duggar, B. M., Bulletin 163, Exp. Sta., Cornell University, 1899.

<sup>8</sup> Loc. cit. <sup>9</sup> Loc. cit., II.

Bolley on potato scab in America were published. In 1897, Frank<sup>10</sup> (II), the well known German plant pathologist, attributed a certain rotting of potato tubers to the rhizoctonia, (*Rhizoctonia-faule*). The more recent work of Rolfs<sup>11</sup>, in Colorado bears distinctly upon the matter of injuries by rhizoctonia on the potato. In Colorado the injuries to stem and shoots and the possible prevention of profitable potato crops are clearly recognized. The results of seed treatment offer reliable evidence as to the parasitic nature of the disease. It is worthy of remark that these vegetative injuries which are the subject of the present discussion should have received so little attention heretofore.

The appended list of papers bearing upon diseases of the potato attributed to rhizoctonia will indicate the known range of injuries referred to it. While Roze has attributed the potato scab (Gale) studied by him in France, to rhizoctonia, no question is here raised respecting the correctness of conclusions of American investigators of the potato scab.

#### PREVENTION OF THIS ROSETTE DISEASE.

Little need be added to the discussion in reference to seed tubers pp. 57, 58

That the injuries may exceed those from the usual scab seems to be within the limits of truth; that injuries of this character may appear to be greater the more clearly they are recognized is also highly probable. The disease inflicts enough injury to render preventive measures profitable, more especially since the method of treatment indicated by our present knowledge is preventive of the commonly recognized scab of potatoes when the treated tubers are planted upon scab-free soil, and of the rhizoctonia rosette disease at the same time under the same stated conditions.

The formalin treatment employed in the experiments and recommended is that of Arthur<sup>12</sup> for potato scab. I quote it below:

“TREATMENT: Add one-half pint of formalin (40 per cent strength) to 15 gallons of water, and soak the seed tubers in it for two hours, then cut and plant.”

By reason of the possible general prevalence of the potato rhizoctonia disease in Ohio, the formalin method should be substituted entirely for that of corrosive sublimate treatment for potato scab.

<sup>10</sup> Loc. cit., I.    <sup>11</sup> Loc., cit.

<sup>12</sup> Bulletin No. 65, Agr'l Exp't Station, Purdue University, 1897.

## LITERATURE LIST.

List of some articles relating to diseases of the potato attributed to rhizoctonia:

- 1858-9 Kuehn, J. *Krankheiten der Kulturgewächse*, pp., 224-228; Plate VII, Figs., 17-21.  
Kuehn attributes the scab (Schorf) to *Rhizoctonia Solani*. His figures of the fungus are quite satisfactory.
- 1868 Hallier, E. *Phytopathologie*. p. 312. Author mentions Kuehn's having referred Schorf or Grind (scab) to the *Rhizoctonia Solani*.
- 1874 Sorauer, P. *Handbuch der Pflanzenkrankheiten*. 1te Aufl; 361, and
- 1886 Sorauer, P. *Handbuch der Pflanzenkrankheiten*. 2te Aufl; 2: 359: under "Kartoffelgrind," author refers Pockenkrankheit and Grind (scab) to *Rhizoctonia Solani*.
- 1875 Hallier, D. E. Ein gefährlicher Feind der Kartoffel. ("A dangerous enemy of the Potato.") *Oester. Landw. Wochenblatt* 1875; 387-388. Describes a disease of potato plants which he attributes to a species differing from *Rhizoctonia Solani*. (Ref. *Bot. Jahresb* 3: 228-229, (1875))
- 1886 Rostrup, E. Undersogelser avgaande Syampealaegten Rhizoctonia. (Studies of the genus Rhizoctonia.) *Kgl. danske Vidensk. Selsk. Forhandl*, 1886: 59-76. Author records the genus as growing on potatoes.
- 1896 Rostrup, E. Report of outbreaks of Diseases of Agricultural Plants (in Denmark) for 1895. (Oversigt over Sygdommenes Optraeden hos Landbrugets Avsplanter i Aaret 1895) *Tidskrift for Landsbrugets Planteavl*. 3: 123-150, Kjobenhavn, 1896. Notes attacks of *Rhizoctonia Solani* on potatoes.
- 1900 Rostrup, E. Report on Diseases of Agricultural Plants in Denmark in 1899. (Oversigt over Landsbrugets Planteavl Sygdommenes i 1899.) *Tidskrift for Landsbrugets Planteavl*. 7: 13-32. (*Zeitschrift f. Pflanzenkrankheiten* 2: 103-104, 1901.) Reports on *Rhizoctonia Solani* in combination with earthworms on potatoes.
- 1895 Dufour, J. Nouveau champignon attaquant la pomme de terre. (New disease of Potato.) (*Arch. des scienc. phys. et nat, de Geneve*, 33: 94-95, (1895)).  
Notes potato plants attacked by *Rhizoctonia*. Species not determined.

- 1896 Frank, A. B., (I). Krankheiten der Pflanzen. Vol. 2, 518.  
Author refers to *Rhizoctonia Solani* as occurring on potato tubers and producing subsequent rotting of the tubers.
- 1897 — — (II). Ueber die Ursachen der Kartoffelfäule. (Causes of potato rots.) Centb f. Bakt u. Parasitenk, 2 abth, 3: 13-17 & 57-59. Author refers to rots of potatoes including rot from *Rhizoctonia Solani* of which he finds two forms of the fungus growth, the dark and the light colored; of these the light colored is parasitic and causes rot.
- 1898 — — (III). Untersuchungen ueber die Verschiedenen Erreger der Kartoffelfäule. (Researches concerning the causes of potato rots.) Ber. d. deutsch Bot. Ges., 16: 273-289. The author names 1, Phytophthora-rot; 2, Rhizoctonia-rot; 3, Fusarium-rot; 4, Phellomyces-rot; 5, Bacterial-rot; 6, Nematode-rot; 7, Ironfleck-rot; 8, Combinations.  
Both the papers, by Frank, here mentioned discuss rotting of potato tubers.
- 1897 Frank, (A. B.) and Sorauer, (P). Jahresbericht des Sonderausschusses fur Pflanzenschutz. (Yearly report of the Special Commission on Plant Protection.) Arb. der Deutschen Landw-Gesell. 1897.  
Authors mention *Rhizoctonia Solani* and describe as living from year to year in the soil.
- 1896 Roze, E. (I). La cause premiere de la maladie de la Gale de la Pomme de terre (Potato Scab) des Americains. Bulletin d. l. Soc. Myc. d. l. France, 12: 126-132.  
This paper is referred to as it appears to be the first of a series. In the later papers the rhizoctonia is regarded as cause of scab.
- 1897 — — (II). La maladie de la Gale de la Pomme de terre et ses rapports avec le *Rhizoctonia Solani* Kuehn. Bull. d. l. Soc. Myc. d. l. France, 13: 23-32.  
Author holds the rhizoctonia to be the cause of the scab as investigated by him in France.
- 1898 — — (III). Histoire de la Pomme de terre, traitée aux points de vue Historique, Biologique, Pathologique, cultural et utilitaire pp. 464, Illust. Paris, 1898.  
Pages 257-355 of the book are devoted to pathology of the potato. The diseases he attributes to rhizoctonia are discussed and illustrated.

- 1898 Ivanoff, K. S. Ueber die Kartoffelbakteriosis in der Umgegend St. Petersburg, in Jahre 1898. (Concerning Bacteriosis of potatoes in the vicinity of St. Petersburg, during the year 1899.) Notes attacks of *Rhizoctonia Solani* on potatoes in connection with other diseases studied.
- 1900 Potel, H. Molestias cryptogamicas da batata ingleza e sui tractamento. (Diseases of potato caused by cryptogamic parasites and their treatment.) Boletin da Agricultura Sao Paulo 1: 45-48. Describes a rot ("pourridie") of the potato in Brazil caused by *Rhizoctonia*.
- 1901 Duggar, (B. M.) and Stewart, (F. C.) The sterile fungus *Rhizoctonia* as the cause of plant discases in America. Bulletin 186, Agricultural Experiment Station of Cornell University, pp. 51-76. Figs. 15-23. Also Bulletin 186, N. Y. Agricultural Exp't Station.  
The authors discuss relation of this fungus to diseases of the potato, more particularly the potato tuber.
- 1902 Rolfs, F. M. Potato failures. Bulletin 70, Colorado Agricultural Experiment Station.  
Attributes recent potato failures in the vicinity of Fort Collins, Colorado, to injuries from *Rhizoctonia* and figures injuries to potato stems and offshoots.



FIGURE 4. Shows hill of diseased, thick-set, "rosette" growth, Wooster, contrasting strongly with Fig 3, and like it representing plants that die off early and produce none or very small tubers. The rhizoctonia lesions are visible near the bases of the stems. (From a photograph.)



FIGURE 5. Fairly vigorous hill of Carman, Wooster, July, showing "rosette" effects of the disease, yet withal, fair promise of tubers. (From a Photograph.)